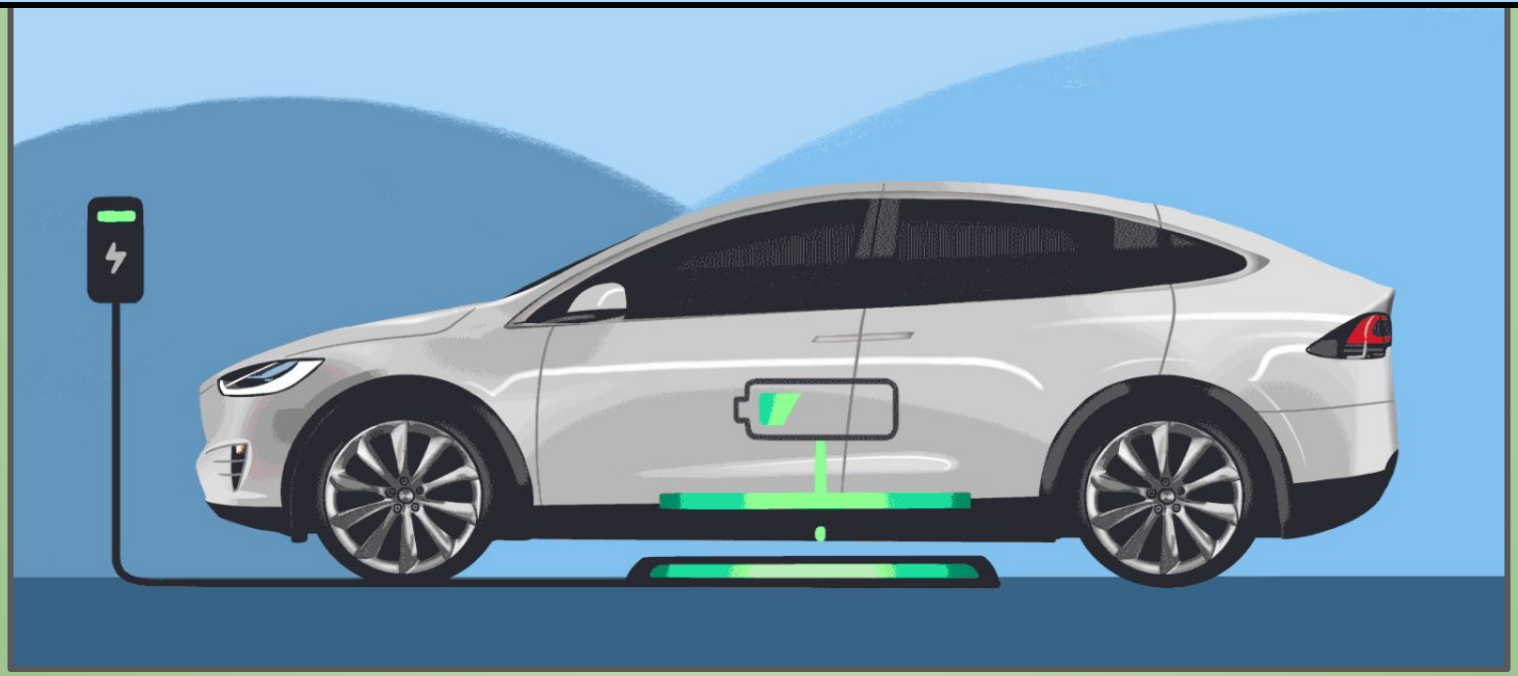
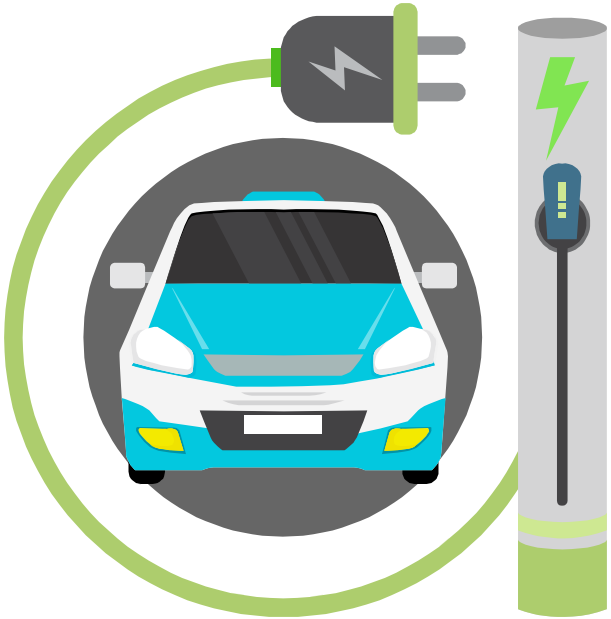
# IoT-Based Wireless EV Charging System For Electric Vehicle



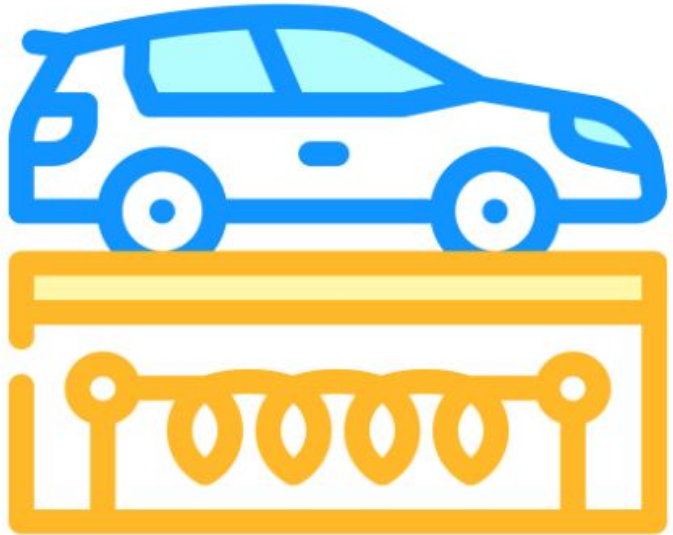
# Problem Statement

The necessity for effective and practical charging infrastructure has arisen from the explosive expansion of electric cars (EVs) in recent years. Conventional plug-in charging techniques have drawbacks in terms of physical connector wear and tear, possible safety risks, and user convenience. Inductive power coil-based wireless charging systems have surfaced as a viable remedy for these issues.Nevertheless, there are a number of issues that need to be resolved when integrating Internet of Things (IoT) capabilities with inductive power coil-based wireless EV charging systems.



# Introduction

This section provides an introduction to the project, covering its background, problem statement, motivation, potential beneficiaries, objectives, and scope. It delves into the project's inception, highlighting the critical need to address flooding through advanced technologies. The discussion touches on the diverse beneficiaries, including local communities, emergency responders, and government agencies. Objectives such as studying existing systems and developing advanced models are outlined, while the scope spans multiple domains, emphasizing the project's comprehensive approach.

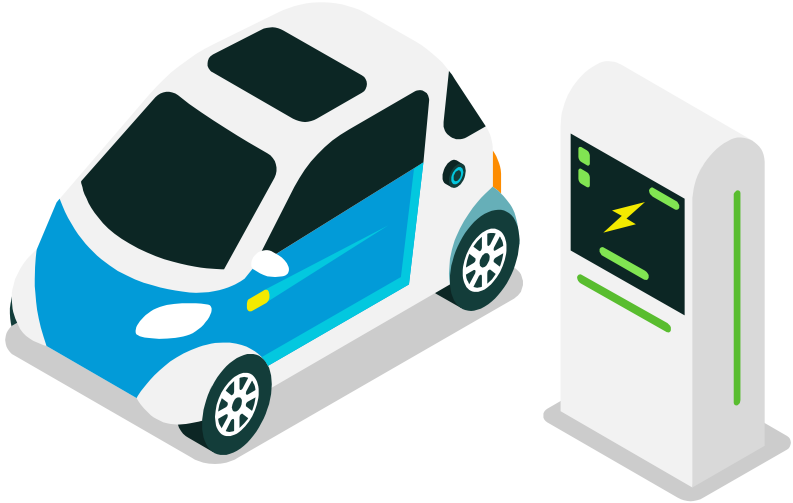


# Objective

1. To initiate the construction of a wireless charging system facilitating vehicle charging without physical connections.
2. To ascertain the optimal distance between the transmitter and receiver coils to minimize power loss.
3. To implement an RFID card/tag authentication system for customer verification.
4. To ensure efficient charging, real-time monitoring, cloud connectivity, data analysis, and remote control.

# Background

Growing concerns about crude oil depletion and environmental impact are driving a crucial shift towards alternative energy sources. Electric vehicles (EVs) are gaining prominence due to their environmental advantages, despite initial purchase costs. Major automotive manufacturers are transitioning to hybrid and all-electric models. However, successful EV market penetration requires robust battery charging infrastructure. Wireless Power Transfer (WPT) systems, especially Wireless Inductive Power Transfer (IPT), offer cable-free charging solutions with advantages spanning various applications. This includes mobile phones, biomedical implants, textiles, space technology, and military applications. The concept of a wireless charger for EVs, employing electromagnetic induction, is central. Nikola Tesla's century-old vision of inductive power transfer without a magnetic core inspires current advancements. The research focuses on midrange wireless transfer capabilities, emphasizing efficient wireless power transfer through factors like resonance frequency alignment and non-radiative magnetic coupling to reduce energy consumption for medium to long-range transmission.



# Literature Survey

| Sr. No. | Title of the Paper | Year of Publication | Publisher | Methodology | Conclusion |
|---|---|---|---|---|---|
| 1 | Iot-Based Wireless EV Charging System For Electric Vehicle Using Inductive Power Coils. | 2023 | International Journal of Current Science (IJCSPUB) | The methodology involves the strategic installation of charging components, the implementation of inductive power transfer techniques for efficient energy transmission, and the integration of an ESP32 module for comprehensive real-time monitoring and feedback provision throughout the charging process. | EVs are crucial in the quest for alternative energy sources to cut down carbon emissions in public transportation.<br><br>Wireless charging devices simplify the EV charging process, offering an effective and user-friendly option.<br><br>Simulation results affirm the efficacy of non radiative wireless power transmission, displaying high efficiency rates at specific distances. |

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| 2 | IoT-Based Electric Vehicle Charging Station | 2022 | International Research Journal of Engineering and Technology (IRJET) | QR Code Scanning and Port Selection: EV owners use an Android app (Java, XML) to scan a QR code above the charging port for selection and balance check.<br><br>Charging Timeout Suggestion: The app recommends an EV charging duration based on the user's wallet balance.<br><br>Communication Cable Verification.<br><br>Charging Initiation: After successful checks, charging starts for the EV. | The system's goal is an automated charging station managed through an Android app, prioritizing user ease and efficient operations. It emphasizes internet-controlled functions and simple payment methods via the app for seamless user experiences. Users can manage charging preferences and payments effortlessly, fostering a worker-free system resembling petrol pumps. Subscription validation via communication cables ensures authorized access, while future considerations include potential bidding processes for EV user allocation, aiming for continual system enhancement. |

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| 3 | Charging Station of Electric Vehicle Based on IoT: A Review | 2022 | Open Access Library Journal | To facilitate the comparison of different techniques, SoC in real-time have been shown. These have been categorised into four classes, as briefly discussed below.<br><br>Looking-Up Table-Based Techniques<br><br>An Ampere-Hour Integral Technique<br><br>The Model-Based Estimation Techniques | Electric vehicles play a crucial role in addressing fuel scarcity and curbing environmental pollution.<br><br>Accessible charging stations, facilitated by IoT and Internet technologies, minimize travel time for users.<br><br>Displaying SOC via apps optimizes energy consumption, extending battery life for efficient usage.<br><br>Station placement in parking areas maximizes convenience, while integrating solar and wind energy diversifies sustainable charging options beyond the primary grid. |

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| 4 | A Review on IoT based Electric Vehicle Charging and Parking System | 2020 | International Journal of Engineering Research & Technology (IJERT) | The mobile app bolsters parking security by sharing slot information and integrating seamlessly with existing infrastructure. Leveraging GPS and automated data generation, the system independently schedules EV charging, reducing errors and time consumption. Implementing a Charging Management System streamlines operations, and wireless charging offers efficiency over traditional plug-in methods while enabling convenient slot bookings. | This paper compares smart parking, charging, and combined charging-parking systems, addressing related issues. It includes a comparative table of research papers and discusses various methods, sensors, controllers, and cloud servers for automatic, reliable, and user-friendly systems. The focus is on developing an efficient Internet of Things (IoT) platform. |

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| 5 | IoT Based Electric Vehicle Charging Station System | 2022 | Grenze International Journal of Engineering and Technology | The Arduino-run system detects EVs using IR sensors, controlling gate access via a servo motor based on slot availability. Upon EV arrival, it showcases Battery State of Charge (SOC) on an LCD and Android app, employing NodeMCU, I2C LCD driver, and IR sensors for automated entry/exit updates. NodeMCU and servo motor manage gate operations while IR sensors update slot statuses on the LCD display during EV entry. | This project explores an IoT-based EV charging system, focusing on architecture, charging methods, and key elements like sensors, LCD display, Node MCU, and cloud integration. It aims to enhance EV charging by offering real-time slot availability and State of Charge (SOC) updates via an LCD display and Android app, streamlining the user experience. The primary goal is to develop an efficient Android app dedicated to monitoring battery SOC, reducing search time for charging stations and slot availability. |

# Summary of Literature Survey

The IoT-Based Wireless EV Charging System for Electric Vehicles demonstrates a promising avenue for efficient and user-friendly charging infrastructure. Through strategic installation of charging components and implementation of inductive power transfer techniques, this system offers a seamless charging experience. The integration of an ESP32 module ensures comprehensive real-time monitoring and feedback provision throughout the charging process, emphasizing the importance of efficient energy transmission and user convenience. As electric vehicles emerge as pivotal alternatives in reducing carbon emissions, the system's wireless charging devices simplify the charging process, signifying a step towards a sustainable transportation future. Further optimization and advancements in IoT-based charging systems hold significant potential in revolutionizing the electric vehicle charging landscape for widespread adoption and environmental benefit

# Need of project

The motivation behind this project stems from the evolving landscape of electric vehicle (EV) technology, which is experiencing a rapid surge in popularity. As the demand for EVs continues to grow, the necessity for efficient and user-friendly charging infrastructure becomes increasingly evident. The current state of affairs in EV charging stations primarily involves physical connections through cables, which possess inherent limitations in terms of user convenience, varying charging standards, and compatibility issues. Addressing these limitations, the endeavor to develop wireless EV charging technology emerges as a compelling solution. This project is motivated by the potential benefits that wireless charging offers, such as the ease of use without physical plugging, the promising prospect of automatic charging, and the elimination of dependency on charging cables. By exploring and advancing IoT-based wireless charging systems, the project aims to augment the existing EV ecosystem. This innovation intends to provide drivers with diverse and convenient charging options, both at home and on the go, thereby fostering the seamless integration of electric vehicles into everyday transportation while overcoming the constraints of traditional charging methods.

# Methodology

The technology of wireless charging is one that is growing quickly and has attracted a lot of attention lately. Monitoring the charging process to guarantee effective and secure charging is one of the difficulties with wireless charging. The ESP32 module is a well-liked option for tracking wireless charging stations due to its low power consumption and wireless capabilities. We go over some of the most current research on ESP32-based wireless charging station monitoring in this overview of the literature. Research indicates that using the ESP32 module as a foundation for monitoring wireless charging stations is dependable and effective. To guarantee effective and secure charging, the ESP32 module offers real-time monitoring, data collecting, and feedback to the user. In order to maximise the functionality and performance of ESP32-based wireless charging stations and to investigate the range of possible uses for them, more study is required.

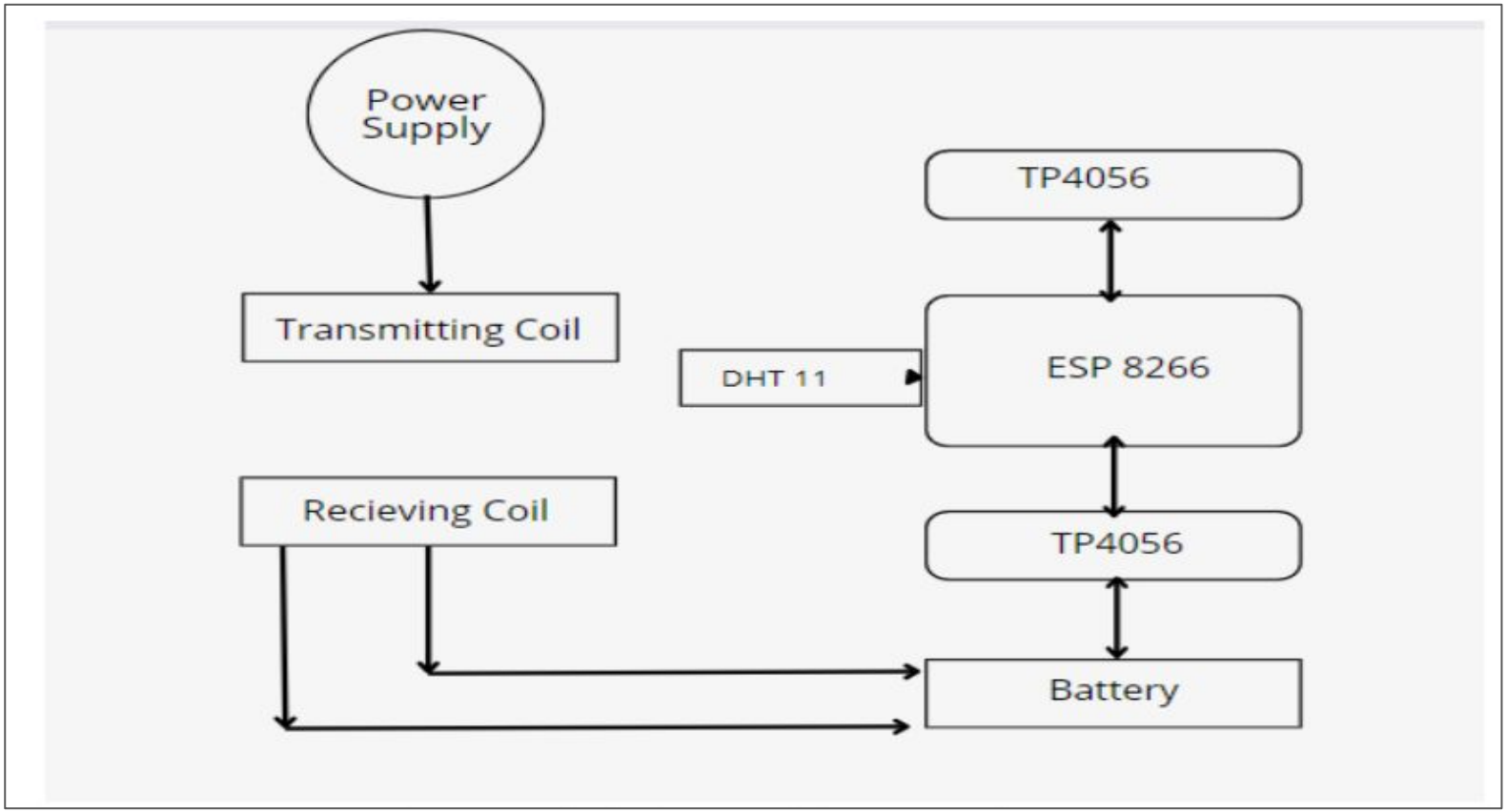



Figure 1: Block Diagram of the Proposed System

# Flow chart

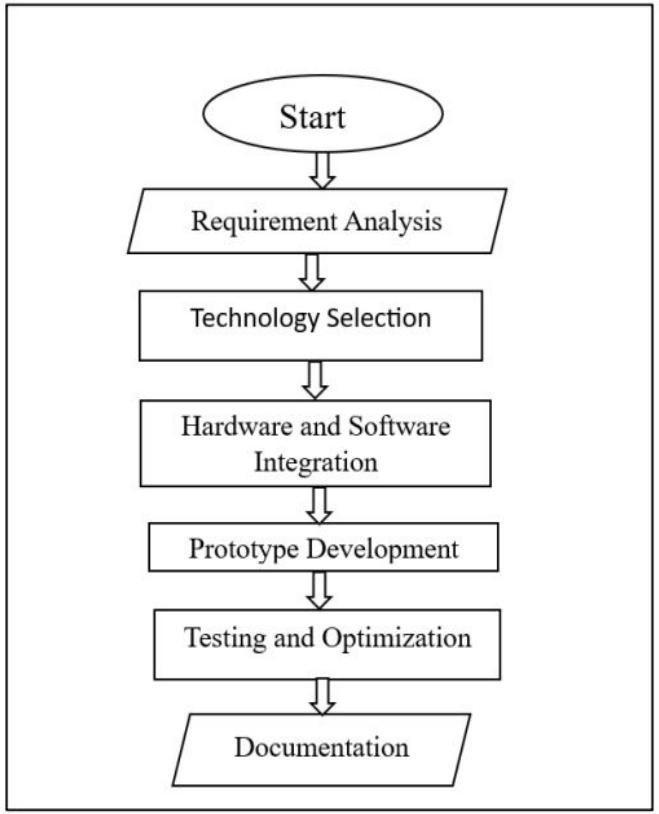
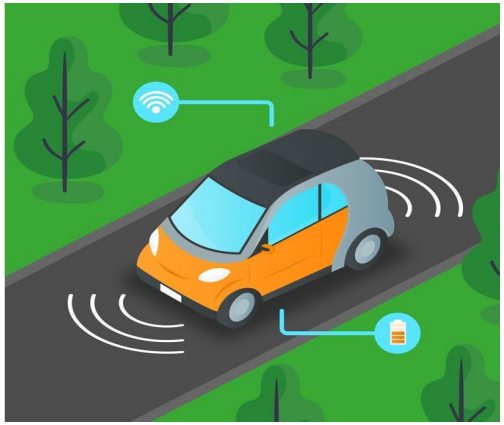



Figure 2: Flowchart Depicting the Working of the System

# EXPECTED CONCLUSION



This project will introduce an innovative solution: an IoT-based Wireless Vehicle Charging Station. It will offer dual-spot functionality and app control, transforming the landscape of electric vehicle charging. The system will prioritize power-saving features, automatic detection capabilities, and user-friendly mobile app control, heralding a new era in enhancing the efficiency of electric vehicle charging infrastructure. Its potential to optimize energy consumption and simplify charging processes is poised to drive forward a more sustainable and user-centric approach to transportation

# Thank You